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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/689,863	10/20/2003	Vivek Agarwal	1138-102	3341

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EXAMINER	
RILEY, SHAWN	

ART UNIT	PAPER NUMBER
2838	

DATE MAILED: 03/29/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/689,863	AGARWAL ET AL.	
	Examiner	Art Unit	
	Shawn Riley	2838	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *election of 24 Feb 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-36 and 41-57* is/are pending in the application.

4a) Of the above claim(s) *37-40* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8,12-36 and 41-57* is/are rejected.

7)☒ Claim(s) *9-11* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *10/04;1/05;6/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Claims 37-40 have been withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 24 Feb 2006.

2. This application contains claims 37-40 drawn to an invention nonelected with without traverse. A complete reply to a final rejection must include cancellation of nonelected claims or other appropriate action (37 CFR 1.144) See MPEP § 821.01.

3. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Specification

1. The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," **"The invention proposes"** "The disclosure describes," "What is disclosed", "The invention relates to", "Methods and apparatus are provided", "The present invention provides", "According to the invention", "The objective of the invention", or like phases, etc. Correction is required. See MPEP § 608.01(b).

Claim Rejections - 35 U.S.C. § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-8, 12-36, and 41-57 rejected under 35 U.S.C. §102(b) as being fully anticipated by Faulk (U.S. Patent 5,841,641). Faulk shows,[1] (in, e.g., the(ir) figures and corresponding disclosure)

As to claim 1;

Power generator apparatus for converting an alternating current (AC) input to a direct current (DC) output, the apparatus comprising: a clock generator (pulse generator 308, see, e.g. column 15 lines 1-10); a power switching device (264/110) gated by the clock generator and coupled to the alternating current (AC) input (through 132) to generate regulated DC output power; a memory device storing digitized reference data (330); and means for comparing the alternating current (AC) input and DC output to effect power circuit function between operating in a first phase at a first frequency and operating in a

1 Note claims will be addressed individually and the material in parentheses are the examiner's annotated comments. Further unless needed for clarity reasons, recited limitation(s), will be annotated only upon their first occurrence. Annotated claims begin with the phrase "As to claim". Claims that are not annotated are seen as having already had the invention(s) addressed previously in an annotated claim and may be repeated for convenience of the applicant/examiner. Bolded words/phrases indicate rejected material based 112 paragraph rejections. Underlined words/phrases indicate objected to material.

second phase at a second frequency; said reference data in said memory device being used to continuously pulse-width modulate (PWM) a duty cycle of a gating signal from the clock generator to the power switch during said second phase.

As to claim 2;

The power generator apparatus according to claim 1 including means for switching from a fixed duty ratio to a continuously pulse-width modulated (PWM) duty ratio of the gating signal and in transitioning from a first frequency to a second frequency (change of continuous to second frequency dependent on input voltage vis a vis output voltage).

As to claim 3;

The power generator apparatus according to claim 1 wherein the AC input current is substantially in phase and in waveshape relative to the AC input voltage such that the power factor presented back to the utility is near unity (no change of inputs phase is described).

As to claim 4;

The power generator apparatus according to claim 1 wherein said first phase at said first frequency is operating in flyback mode and said second phase is operating in both flyback and voltage mode (circuit is shown as a flyback converter and the circuit operates based on voltage).

As to claim 5;

The power generator apparatus according to claim 1 wherein both said first and said second phases are operated in flyback mode (states that circuitry operates in flyback).

As to claim 6;

The power generator apparatus according to claim 1 wherein the duty cycle of said first phase at said first frequency is modulated by an error signal comprising the difference between a first voltage which is the regulated output voltage V.sub.o and a second reference voltage V.sub.REF such that the duty cycle is varied to maintain a constant output voltage under varying loads (basic def of a converter with feedback).

7. The power generator apparatus according to claim 1, wherein the power switching device is operated at a maximum of 50% duty ratio at full load during the first phase.
8. The power generator apparatus according to claim 1 wherein the input to output voltage ratio is in a range of 5:1 or more.
12. The power generator apparatus according to claim 1, wherein the switching frequency for operating said first phase is equal to approximately 12.5 kHz for 50 Hz to 60 Hz utility.
13. The power generator apparatus according to claim 1, wherein the switching frequency for operating said first phase is equal to approximately 80 kHz for 400 Hz utility.
14. The power generator apparatus of claim 1, wherein said second frequency is approximately twice the said first frequency.
15. The power generator apparatus of claim 1, wherein said first phase of operation is approximately centered around a

zero-crossing of the AC input waveform and wherein said second phase of operation is present in the rest of the input AC cycle complementary thereto.

As to claim 16;

The apparatus of claim 1 further comprising: a transformer (T1) including a primary winding in series with the power switching device and a secondary winding; plural diodes (132) operatively coupled to said primary winding to effect rectification of the AC input; plural diodes operatively (154/116) coupled to said secondary winding to perform a rectification function on the output of the secondary winding; an inductor (104) operatively coupled to the output of said plural diodes; and a capacitor (118) across the output to be connected in parallel with the load.

As to claim 17;

The apparatus of claim 16 wherein the rectification function on the output of the secondary winding of the transformer is accomplished through using either Schottky diodes (154) or synchronous rectification (116).

20. Power generator apparatus for converting an alternating current (AC) input to a regulated direct current (DC) output, the apparatus comprising: said power generator circuit including a single power switching device coupled to said AC input for generating regulated DC output power; a clock generator providing a clock signal; means for comparing the AC input and DC output to effect power circuit function by varying the clock rate between operating in a first phase at a first fixed frequency and operating in a second phase wherein said first fixed frequency transitions to a second

fixed frequency; a memory device storing at least representative portions of digitized reference data; and control means using said data to continuously pulse-width modulate the duty cycle of the clock signal to said power switching device during said second phase.

21. The power generator apparatus of claim 20 wherein the second operating frequency of the second phase is higher than the operating frequency of the first phase leading to reduced peak currents and stresses in the power generator circuit.

22. The power generator apparatus of claim 21 including a transformer wherein the second operating frequency of the second phase is higher than the operating frequency of the first phase leading to reduction in system weight and volume.

23. The power converter apparatus of claim 20 in which the clock generator is operative to employ two discrete frequencies in its operation within any given AC cycle to spread the noise spectrum and reduce the magnitude of its total harmonic content and EMI/RFI effects.

24. The power converter apparatus according to claim 20 further comprising: a transformer including a primary winding and a secondary winding; plural diodes operatively coupled to said primary winding; plural diodes operatively coupled to said secondary winding to effect rectification; a single power switching device operatively coupled to said plural diodes of said primary winding; an inductor operatively coupled to said secondary winding and said plural diodes; and a capacitor connected at the output in parallel with the load; wherein the converter apparatus operating in flyback mode in a first phase at a first frequency when the output voltage reflected back to the input is higher than the absolute value of the instantaneous AC input voltage and the converter apparatus operating in a second phase in a combination of forward and flyback mode wherein the operating frequency transitioning from said first frequency to a second frequency when the output voltage reflected back to the input is lower than or equal to the absolute value of the instantaneous AC input voltage.

25. The apparatus of claim 24 wherein said inductor on the secondary having terminals connected to the cathode of each of the top bridge rectifier diodes; and the cathode of the top bridge rectifier diode attached to the negative polarity of the secondary winding of the transformer further connecting to the output capacitor to equally share in delivering energy to the load by the transformer and the secondary inductor in phase 2 operation.

26. The power converter apparatus according to claim 24 wherein the duty cycle of said first phase at said first frequency is

maintained constant corresponding to a given load and the second phase is continuously pulse-width modulated.
27. The power converter apparatus according to claim 24, wherein the second frequency is approximately an integer multiple of the first frequency.
28. The power converter apparatus according to claim 24, wherein the first phase of operation is approximately centered around a zero-crossing of the AC input waveform and wherein the second phase of operation is complementary thereto.
29. The power generator apparatus according to claim 20 in which the control means utilizes duty cycle control in conjunction with two discrete operating frequencies wherein the duty cycle in phase 1 is fixed for a fixed load and varies when the load varies.
30. The power generator apparatus according to claim 29 further comprising: a transformer including a primary winding and a secondary winding; plural diodes operatively coupled to said primary winding; plural diodes operatively coupled to said secondary winding; a single power switching device operatively coupled to said plural diodes of said primary winding; an inductor operatively coupled to said secondary winding and said plural diodes; and a capacitor connected at the output in parallel with the load; wherein the converter apparatus operating in flyback mode with a fixed duty cycle corresponding to the given load, when the output voltage reflected back to the input is higher than the absolute value of the instantaneous AC input voltage and the converter apparatus operating in a combination of flyback and forward conversion modes, with pulse-width modulated duty cycle, when the output voltage reflected back to the input is lower than or equal to the absolute value of the instantaneous AC input voltage.
31. The power generator apparatus according to claim 30 wherein the THC is between 1% to 2%.
32. The power generator apparatus according to claim 20 wherein the control means is integrated into an integrated circuit or a compact hybrid circuit to define a compact intelligent module.
33. The power generator apparatus according to claim 20 wherein the control means employs a control scheme which continuously compares the AC input with the regulated output to effect power control function between operating in a first phase at a first frequency when the output reflected back to the input is higher than the absolute value of the AC input and operating in a second phase wherein the operating frequency transitioning from said first frequency to a second frequency when the output reflected back to the input is lower than the instantaneous AC input within a cycle.

34. The power generator according to claim 33 wherein the first phase is operated in flyback mode and the second phase is operated in a combination of flyback mode and forward mode.
35. The power generator according to claim 33 wherein said apparatus is continuously operated in the flyback mode.
36. The power converter apparatus according to claim 22 wherein the input to output transformation is adjusted to have high current and low voltage capability suitable for charging batteries.

For method claims 41-57, note that under MPEP 2112.02, the principles of inherency, if a prior art device, in its normal and usual operation, would necessarily perform the method claimed, then the method claimed will be considered to be anticipated by the prior art device. When the prior art device is the same as a device described in the specification for carrying out the claimed method, it can be assumed the device will inherently perform the claimed process. In re King, 801 F.2d 1324, 231 USPQ 136 (Fed. Cir. 1986). Therefore the previous rejections based on the apparatus will not be repeated.

41. A method for AC-to-DC power conversion comprising: inputting AC Power at a predetermined AC frequency and voltage V.sub.ac; full-wave rectifying the input AC power to produce a full-wave rectified voltage V.sub.i having an amplitude proportional to absolute value V.sub.ac; applying voltage V.sub.i across a primary of a transformer in series with a gate-controlled switch to produce a current I.sub.M; coupling a secondary of the transformer to an output rectifying bridge to produce a regulated output voltage V.sub.o across an output capacitor C.sub.o to a load; comparing input voltage V.sub.i with a voltage V.sub.o' where V.sub.o'=V.sub.o (N1/N2) and N1/N2 is the inverse turns ratio of the transformer; if V.sub.i is less than V.sub.o', then clocking the gate-controlled switch at a first fixed frequency f.sub.1, so that current I.sub.M is a discontinuous flyback current; and if V.sub.i is greater than V.sub.o', then clocking the gate-controlled switch at a second fixed frequency f.sub.2, where f.sub.2 is unequal to f.sub.1 and the current I.sub.M is a discontinuous flyback and forward current.
42. A method according to claim 41, in which f.sub.2 is greater than f.sub.1.
43. A method according to claim 41, in which f.sub.2 is approximately an integer multiple of f.sub.1.
44. A method according to claim 41, in which, when clocking at

f.sub.1 and for an invariant load, the switch is clocked at a fixed duty ratio.
45. A method according to claim 44 in which the duty cycle has a maximum of 50 percent.
46. A method according to claim 41, in which, when clocking at f.sub.1, and for a load which is increasing, the switch is clocked at a proportionately increasing duty ratio.
47. A method according to claim 46 in which the duty cycle has a maximum of 50 percent.
48. A method according to claim 41, in which, when clocking at f.sub.1, as V.sub.i increases, the current I.sub.M has an average in the discontinuous flyback current which increases proportionately to voltage V.sub.i.
49. A method according to claim 41, in which, when clocking at f.sub.2, the switch is clocked at a duty cycle which is continuously pulse-width modulated with pulses whose duty ratio D is proportionate to the square root of 1/(A+B/V.sub.i) where A and B are constants dependent on primary and secondary inductance values, the transformer turns ratio and the output voltage.
50. A method according to claim 49, in which the maximum duty ratio is 50 percent.
51. A method according to claim 41, in which the output rectifying bridge includes an inductor positioned in series with the secondary of the positive polarity terminal of the transformer through a diode to store and discharge energy during a forward mode of operation of the bridge.
52. A method according to claim 51, in which an inductance L of the inductor is proportioned to an inductance L.sub.1 of the primary of the transformer to apportion energy supplied to the load between the inductor and the transformer.
53. A method according to claim 51, in which the frequency f.sub.2 is selected in proportion to one or more of the size and rating of the transformer.
54. A method according to claim 41, in which the comparing step between V.sub.i and V.sub.o' during each cycle of the input AC power alternates the clocking frequency between two discrete values f.sub.1 and f.sub.2 to synthesize the regulated output voltage V.sub.o in relation to a reference voltage.
55. A method according to claim 51, in which the load is a reactive load and the inductor and transformer are proportioned so that a power factor as seen by the input AC power is close to unity.
56. A method according to claim 41 including, during valleys of the rectified input AC voltage, operating in flyback mode with a fixed duty cycle and a fixed first frequency at a given load with a

maximum duty cycle of 50% at full load, and when the rectified input AC voltage exceeds the reflected output voltage, operating in flyback as well as the forward conversion mode at the second fixed frequency which is a multiple of the first frequency while modulating the duty cycle continuously.
57. A method according to claim 41, in which, when operating at the second frequency f.sub.2, the switch is clocked at a duty cycle which is continuously pulse-width modulated with pulses whose duty ratio D is in accordance to Equation (39) 40 D = V m Sin 1 8 { 2.5 V m Sin - 2 (N 1 N 2) V 0 } .

Claim Rejections - 35 U.S.C. § 103

3. The following is a quotation of 35 U.S.C. § 103 which forms the basis for all obviousness rejections set forth in this Office action:

> A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.
>
> Subject matter developed by another person, which qualifies as prior art only under subsection (f) or (g) of section 102 of this title, shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person.

4. Claims 18 and 19 are rejected under 35 U.S.C. § 103 as being unpatentable over Faulk. The Faulk reference discloses the limitations of the invention as claimed as described above. However, Faulk does not show a full wave voltage rectifier for a dual output secondary. Official notice is taken that it would have been obvious at the time the invention was made to utilize a full wave voltage rectifier for a dual output secondary into the circuit of Faulk for the reason of having twice the outputs to reduce strain on circuit elements if only a single output were used.

Allowable Subject Matter

5. Claims 9-11 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

6. As allowable subject matter has been indicated, applicant's response must either comply with all formal requirements or specifically traverse each requirement not complied with. See 37 C.F.R. § 1.111(b) and section 707.07(a) of the M.P.E.P.

7. The following is an examiner's statement of reasons for allowance: As to claim 9, no prior art uncovered anticipates or renders obvious applicant(s) claimed first frequency to the second frequency in the second phase includes means for comparing a rectified input AC voltage and a reference point FCOP to minimize distortion and maintain near unity power factor.

Further, as to claim 10, no prior art uncovered anticipates or renders obvious applicant(s) claimed stored digitized reference data is a time sequence representation of a string of duty cycles which the power switching device must operate with in accordance with the characteristics of the AC input voltage to PWM the duty cycle.

Further, as to claim 11, no prior art uncovered anticipates or renders obvious applicant(s) claimed output voltage reflected back to the input is higher than the absolute value of the instantaneous AC input voltage and said second phase of operation is when the value of the output voltage reflected back to the input is lower than or equal to the absolute value of the instantaneous AC input voltage, wherein during said second phase the operating frequency transitioning from said first frequency to said second frequency is higher than said first frequency.

Conclusion

Any inquiry from other than the applicant/attorney of record concerning this communication or earlier communications from the Examiner should be directed to the Patent Electronic Business Center (EBC) at 1.866.217.9197. Any inquiry from a member of the press concerning this communication or earlier communications from the Examiner or the application should be directed to the Office of Public Affairs at 703.305.8341. Any inquiry from the applicant or an attorney of record concerning this communication or earlier communications from the Examiner should be directed to Examiner Riley whose telephone number is 571.272.2083. The Examiner can normally be reached Monday through Thursday from 7:30-6:00 p.m. Eastern Standard Time. The Examiner's Supervisor is Karl Easthom who can be reached at 571.272.1989. Any inquiry about a case's location, retrieval of a case, or receipt of an amendment into a case or information regarding sent correspondence to a case **should be directed to 2800's Customer Service Center** at 571.272.2815. Any papers to be sent by fax MUST BE sent to fax number **571-273-8300**. Any inquiry of a general nature of this application should be **directed to the Group receptionist** whose telephone number is 571.272.2800. Status information of cases may be found at http://pair-direct.uspto.gov wherein unpublished application information is found through private PAIR and published application information is found through public PAIR. Further help on using the PAIR system is available at 1.866.217.9197 (Electronic Business Center).

March 06

Shawn Riley
Primary Examiner